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Peculiarities of the vertical and geographical distribution of particulate organic matter over West Siberia

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In recent years, we have performed aerosol sampling in the atmospheric surface layer (ASL) over different regions of West Siberia in order to reveal peculiarities of the geographical distribution of particulate organic matter (POM). Investigation of the vertical distribution of POM in the troposphere was undertaken by means of aerosol sampling from Optik TU-134 aircraft laboratory in the atmospheric layer from 2 to 8 km during three YAK-AEROSIB campaigns (2012, 2013, and 2014). Aerosol samples were collected onto Teflon filters (PTFE membranes, GRIMM 1.113). The collected aerosol samples were treated as follows: the organic part was extracted from the filter, using chromatographic acetone in an ultrasonic bath; then, it was concentrated in vacuum up to 50 μL, with the subsequent analysis using a chromatography mass spectrometer Agilent 6890N (50 - 250 $^\circ$ with a rate of 5 $^\circ$/min., isotherm at the initial and final temperature – 3 and 45 min, respectively). Hydrocarbons were identified using mass spectral library databases NIST, Wiley, as well as by comparing retention times of reference compounds in model mixtures (Alkane Standard Solutions C8 – C20 and C21 – C40 by SIGMA –ALDRICH).

Total organic matter varied from 244.56 ng/m3 in aerosol samples collected in the ASL to 0.08 ng/m3 in the free troposphere (FT) over the Kara Sea. Significant differences were also found in the geographical distribution of POM due to different volatile organic compounds emitted by vegetation in specific regions. Differences between concentrations of POM sampled in the free troposphere over the continent and ocean can exceed an order of magnitude. Average concentration of organic compounds in the ASL is close to 30 ng/m3 and it decreases exponentially with height down to 14 ng/m3 at the top of the atmospheric boundary layer and 5 ng/m3 in the FT.